


Memorandum


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Division of Engineering Services

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Girard Rd UC – NB & SB
Bridges No. 34-0165 L/R

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Subject: Preliminary Foundation Recommendations

INTRODUCTION

This memorandum provides preliminary foundation recommendations for the Girard Rd UC – NB & SB (Bridges No 34-0165 L/R) in the City of San Francisco, San Francisco County, based on the advance planning study plan dated December 6, 2006. The proposed Girard Rd UC – NB & SB consist of two one-span structures spanning a retaining cut in which Girard Road is located. The roadway slab may need to resist uplift due to hydrostatic pressure. The proposed structures are part of the project to replace Doyle Drive, a stretch of Highway 101 extending to the southern approach of the Golden Gate Bridge. The existing stretch includes an approximately 1520 foot long high viaduct near the western end and an approximately 3730 foot long low viaduct at the eastern end. There is likely hood that the APS plans will be revised and the Girard Road UC – NB & SB Bridges will become two span bridges and the bridge abutment locations will change. The new abutment locations will likely be away outside the limits of the Girard Road Depressed Section. Although, the new plans have not been finalized, these suggested changes are unlikely to affect our preliminary foundations recommendations significantly. We will reevaluate our preliminary recommendation when the new plans become available.

GEOLOGY AND SUBSURFACE CONDITIONS

The bedrock in the Presidio is mid Jurassic to mid Cretaceous Franciscan formation. The Franciscan formation is highly variable, and may range from very hard chert or argillite (mudstone) to relatively softer greywacke (sandstone) and serpentine. The Pleistocene Colma Formation overlies the Franciscan. The Colma Formation is made up mostly of poorly consolidated marine sand.

At the Girard Rd UC – NB & SB site, the Colma Formation is not present, and Franciscan bedrock is overlain by fill and thick Quaternary deposits such as beach sand.

There is no existing field investigation conducted for the Girard Rd UC – NB & SB site. The nearest existing field tests include two cone penetration tests (CPT-3 and CPT-4) and three rotary borings (HGB-1 through HGB-3) conducted by Taber Consultants in January 2001 as part of preliminary subsurface investigation for the entire Doyle Drive replacement project. The approximate distance from the cone penetration tests to the site is 820 ft and 570 ft, for CPT-3 and CPT-4, respectively. The approximate distance from the rotary borings to the site is 1140 ft, 2100 ft, and 2100 ft, for HGB-1, HGB-2, and HGB-3, respectively. Based on HGB-2, HGB-2, CPT-3, and CPT-4, the site is underlain by 13 ft to 32 ft of loose to compact silty and clayey sand, interbedded with very soft to soft clay. Underlying very dense silty and clayed sand was encountered to approximate elevation -61 ft, or a depth of 72 ft. Below this layer is hard sandy and silty clay and clay up to the maximum exploration depth. Based on Boring HGB-1, the site is underlain by dense to very dense silty and clayey sand to the maximum exploration, with a very soft clayey silt layer present between approximate Elevations 12.5 ft and 21.5 ft.

Please note that the site conditions vary rapidly in the vicinity of the Girard Road UC – NB & SB site. The worst-case conditions anticipated at the site are described in this preliminary report and in the Girard Depressed Section preliminary report. Even though these sites overlap, subsurface conditions are described differently. This is reflective of highly variable conditions at the site and limited information available at this time. The conditions will be described more accurately in the final foundation reports.

The Final Hydrological and Water Resource Technical Report for Doyle Drive project dated October 2004, prepared by Baseline Environmental Consulting, and other data obtained from the Report titled Final Corrective Action Plan, Building 1065, Presidio, San Francisco, California, dated January 2007, prepared by MACTEC, indicate that the site is underlain by shallow and deep groundwater zones (aquifers). The groundwater in

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the shallow zone is unconfined and is located approximately 6 ft below ground surface, or approximate Elevation 6.0 ft. Wells screened in the deeper zone show that it is confined with substantial upward vertical gradient. Several of the wells installed in the vicinity of the site were found to be flowing artesian wells and the stabilized potentiometric head water level was above the ground surface. At this time, we do not have quantitative information regarding the potentiometric water head, but, we estimate that the head is approximately 2 to 3 feet above the ground surface. The groundwater zones are likely separated by an aquitard consisting 2 to 3 feet thick layer of stiff silty clay. The data obtained from the above referenced reports indicate that the permeability of the deeper aquifer is low to medium.

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The consulting firm, Parsons Brinkhoff, is working on the final hydraulic report. The finding will be included in the foundation recommendations.

CORROSIVITY

The site is anticipated to be corrosive due to its proximity to the San Francisco Bay and the past existence of a tidal marsh. Corrosion samples will be collected from this site during future field investigation and tested. Sampling and testing of site soils and groundwater shall be in conformance with the Corrosion Guidelines for Foundation Investigations (Caltrans, 2003).

SEISMICITY/LIQUEFACTION POTENTIAL

Hossain Salimi from Office of Geotechnical Design West will provide preliminary seismic recommendations for this structure.

FOUNDATION TYPE RECOMMENDATIONS

Cast-In-Steel-Shell (CISS) piles, standard Caltrans open-ended pipe piles, and H piles are feasible choices for the proposed structures, based on the available subsurface information. Driving these types of piles may generate vibration and noise, but may fall within acceptable levels. Suitable corrosion mitigation measures need to be recommended and/or accounted for during final design.

Cast-In-Drilled-Hole (CIDH) piles are another feasible alternative. However, casing may be needed because of the caving potential due to the granular materials at the site, the high ground water table, and the artesian conditions. Difficulties in construction and anomalies within piles may be anticipated with CIDH piles under such site conditions. Artesian conditions may cause serious problems when installing CIDH piles at the site, including blow out of bottom of piles during excavation and pored concrete being washed away. If noise and vibration are of extreme concern, CIDH piles may be considered instead of CISS piles, standard open-ended pipe piles, and H piles. If further field exploration conducted before the final design concludes the artesian conditions, do not preclude the use of CIDH piles at the site.

Concrete driven piles and close-ended pipe piles are not recommended due to the impact on the nearby existing structures and environment caused by potentially excessive noise and vibration during pile driving, and anticipated hard driving/refusal.

The presence of shallow and deep groundwater aquifers at the site will likely affect the design and construction of the proposed bridge pile foundation. The proposed pile cap will be located below the groundwater table in the shallow groundwater zone and is an area that will be influenced by artesian pressure. The effect of artesian hydrostatic pressure shall be considered in the computing nominal axial pile resistance and pile cap design. Detailed recommendation will be provided in the final Foundation Report.

CONSTRUCTION COSIDERATIONS

The proposed excavation for the pile cap will extend close the top of the deep aquifer. Our preliminary calculations show that the anticipated reduction in overburden pressure due to excavation can cause uplift (blowout) of the excavation bottom due the artesian pressure. The APS show that the bridge abutments are located within the Girard Road Depressed Section. The recommendations to control groundwater and prevent blowout outlined in the Preliminary Foundation Report (PFR) for the Girard Road Depressed – Retaining Walls are applicable for this bridge structure. If the revised plans place the bridge abutments out side the Limits of the Girard Road Depressed Section, it is our preliminary opinion that the bottom blowout can be prevented by installation of bleeder wells through the separating clay layer (aquitard) between the aquifers and dewatering the site. The spacing and diameter of the bleeder wells will depend on the permeability and water head in the deeper aquifer. Dewatering of the shallow aquifer should be performed prior to installation of bleeder wells.

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ADDITIONAL FIELD WORK AND LABORATORY TESTING

Further field exploration, specifically rotary wash borings, is needed. One rotary boring at each support for the Girard Road UC – NB & SB Bridges with exploration depth of 100 ft is recommended. Additionally, multistage piezometer(s) and pump test(s) are needed to determine the permeability and piezometric water heads at the site.

The number, locations, and depth of borings will be adjusted depending on the locations of supports, load demands, and pile/foundation type used in the final design. Soil samples will be collected for corrosion test, and other laboratory tests to obtain soil parameters necessary for foundation design.

Regulation pertaining to cross contamination of the aquifers during drilling operation has to be considered when planning the subsurface investigation. Use of conductor casing to isolate zones within the drilled hole will be required. Control of groundwater flow due to artesian pressure will also be required.

The recommendations contained in this report are not final. A request for final recommendations should be made during final project design, and sent to the Office of Geotechnical Design West. Any questions regarding the above recommendations should be directed to the attention of Tung Nguyen at 510-622-1775 or Caroline Chen at 916-227-5386.

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